MATH 020: DAY-BY-DAY COURSE OUTLINE

NEW TOPICS to be covered for midterm and final exams:	4. Scientific notation, including 2-step multiplication/division problems
1. Function notation 2. Proportions and percents 3. Solving linear inequalities	5. Solving multi-step quadratic problems: e.g., $x^2 + 2x = 15$; $10x^2 = 490$

I. THE REAL NUMBER SYSTEM AND INTRODUCTION TO ALGEBRA (3 sessions):

Day 1: 1. Introduction: sets of integers, rational, irrational and real numbers;
2. The real number line;
3. Absolute value;
4. Comparing, ordering ($<, =, >$), and trichotomy (*e.g.,* $-1 < 0 < 5$);
5. Addition of real numbers and properties of addition;
6. Subtraction of real numbers.

Day 2: 1. Multiplication of real numbers and properties of multiplication;
2. Division of real numbers;
3. Powers of real numbers with natural number exponents;
4. Order of operations, including multiple grouping symbols and exponents.

Day 3: 1. The concept of variable and constant; defining like and unlike terms;
2. Definition of algebraic expressions and like terms:
   a) Term:
     i. Numerical coefficient (including implied 1 and -1);
     ii. Literal part;
     iii. Monomial, binomial, polynomial;
   b) Like and unlike terms;
3. The substitution principle, including function notation, but not domain or range;
4. Evaluating formulas and algebraic expressions**.**

II. LINEAR EQUATIONS AND INEQUALITIES IN ONE VARIABLE, TOGETHER WITH APPLICATIONS (9 sessions):

Day 4: 1. Simplifying expressions by combining like terms:
   a) Using the distributive property to remove parentheses (expansion);
   b) Using the distributive property to combine like terms (contraction).
2. Definition and solution of a linear equation in one variable;
3. Solving linear equations using Addition/Subtraction & Multiplication/Division Principles of Equality;
Application problems (e.g., "three less than twice a number is what?").

Day 5: Solving a linear equation involving parentheses, fractions, and decimals; identities and contradictions.

Day 6: Solving and graphing linear inequalities.

Days 7-8: Solving word problems (application problems) using linear equations:
   a) Solving literal equations for a given variable, including perimeter and area formulas;
   b) Translating from English to algebra, e.g., "15 is 12 less than 2 times a number"; "30 subtracted from 7 times a number is 4."

Day 9: More algebra word problems, including consecutive integer problems, averages, perimeter and area problems, and linear inequality problems.

Days 10-11: Application or word problems that involve a linear equation with percents, proportions, formulas, etc.:
   a) Percent problems, including percent increase or decrease;
   b) Proportion problems;
   c) Rate problems.

Day 12: UNIT TEST I (non-departmental): General review, which should include at least the following: order of operations, substitution (including function notation), signed numbers, translation problems, solving linear equations, solving and graphing linear inequalities, and percent and proportion word problems.

(12 classes total, including Unit Test I)

III. EXPONENTS AND OPERATIONS WITH POLYNOMIALS AND SPECIAL PRODUCTS (7 sessions)

Day 13: The 7 exponent rules, including negative exponents (no rational exponents).

Day 14: Introduction to scientific notation.

Day 15: Applications & operations involving scientific notation; including 2-step multiplication and division problems (e.g., perform operation, then convert 12×10^8 to 1.2×10^9).

Day 16: Addition and subtraction of polynomials.

Day 17: Multiplication of polynomials:
   a) A monomial times a monomial, including exponents and variables;
   b) A monomial times a polynomial (the distributive property);
   c) A binomial times a binomial:
      i) FOILing;
      ii) Special Products (perfect square trinomials; difference of two squares);
   d) A binomial times a trinomial (e.g., $(3x-5)(x^2-6x+4)$

Day 18: Division of Polynomials:
   a) A monomial by a monomial;
   b) A polynomial by a monomial, where quotient has no remainder (*i.e.,* no division by more than a monomial).

Day 19: UNIT TEST II (Exponents, operations with scientific notation, polynomials).

(19 classes total, including Unit Test II)

IV. FACTORING AND APPLICATIONS (7 sessions):

Day 20: 1. Factor, prime factor, and greatest common factor;
   2. Factoring a polynomial that has a common factor in each of its terms;
   3. Factoring by grouping, with up to 4 terms, & terms with multiple variables (*e.g.*, $45cw+63cz-20dw-28dz$; $21ab-14ax+15by-10xy$).

Day 21: Factoring trinomials of the form x^2+bx+c.

Day 22: Factoring trinomials of the form $ax^2 + bx + c$.
Day 23: 1. Factoring perfect square trinomials;
2. Factoring the difference of two squares;
3. Factoring completely, including multi-step problems such as $36x^2y - 100y^3$ (GCF + difference of two squares);
Day 24: Solving quadratic equations by factoring, including multi-step factoring $(e.g., 4b^2 + 8b = 0)$.
Day 25: Solve multi-step quadratic equations $(e.g., x^2 + 2x = 15; 10x^2 = 490)$.
Day 26: Review for Departmental Midterm.

(26 classes total)

V. **Day 27: DEPARTMENTAL MIDTERM** (1 session).

(27 classes total, including Midterm; 15 classes left)

VI. **ROOTS AND RADICALS** (4 sessions):
Day 28: 1. Finding roots;
2. Simplifying radicals.
Day 29: Addition and subtraction of radicals.
Day 30: Multiplication and division of radicals (without conjugates), simplified completely.
Day 31: Pythagorean Theorem: given any two sides, find the third side.

(31 classes total)

VII. **CARTESIAN GEOMETRY** (8 sessions):
Day 32: 1. The Cartesian coordinate system;
2. Ordered pairs of real numbers and finding points in a plane, given a table;
3. Function notation: computing outputs for linear and quadratic equations (e.g., given $f(x) = 3x^2 + x - 1$, find f(-3));
Day 33: 1. Definition and solution of a linear equation in two variables ($ax + by = c$).
2. Graphing a linear equation:
a) By finding two points;
b) By the x- and y-intercepts method;
c) Equations of horizontal and vertical lines (*e.g.,* find the equation of the horizontal line passing through the point (-5,3); find the equation of the vertical line passing through the point (-5,-2)).
Days 34-35: Concept of the slope of a straight line:
1. Slope formula;
2. Finding the slope of a line on a graph given its equation;
3. Finding the slope of a line using $y = mx + b$;
4. Given possible graphs of a line, use slope and y-intercept to select correct graph;
5. Slopes of horizontal and vertical lines (slopes of lines parallel to the x- and y-axes).
Day 36: Finding equations of lines:
1. Using the slope-intercept formula ($y = mx + b$);

2. Using the point-slope formula;
3. Given two points on the line.

Day 37: Systems of two linear equations in two variables, including rational coefficients:
1. Three possibilities: intersecting lines, parallel lines, coincident lines.
2. Substitution method.
3. Addition method.

Day 38: UNIT TEST III (non-departmental): Roots and radicals; Cartesian geometry, including finding equations of lines and finding correct graph given equation.)

Day 39: Rational expressions as a review of factoring: simplification, multiplication and division.

(39 classes total, including Unit Test III)

VIII. FINAL WEEK OF CLASS

Day 40: Further review of rational expressions and solving quadratic equations.

Day 41: Review of Test III and review for Final Exam.

Day 42: Review for Final Exam.

Please be advised that while the instructor may change the order and the pacing, she/he is responsible for covering in time all topics represented before the respective departmental midterm & final exams.